APPENDIX III
PROCESS NOTES FOR CREATING BASE YEAR GRIDDED MOBILE EMISSIONS SURROGATE

5/17/00

Gridding up mobile emissions. Start with the outlying counties and first grid up the vmt surrogates by facility type (FC).

Spatial surrogate codes, which I will create for mobile

10	local
20	freeway
30	ramp
40	arterial
41	rural arterial

The rural arterial is a separate surrogate because of the way vmt is reported by UDOT for the outlying counties. It is both put on a network and additional vmt is reported in the towns and outlying parts of the county.

In a sense what this rural arterial surrogate does is replace the ramp surrogate in the urban areas.

Workspace: /TRINIDAD/UAM_AERO/WS.UAMAERO/WS.MOBILE

Arc: copy UDOT_AERO outly_udot

Now get rid of the roads in the 4 WF counties.
Done in AE.

Arc: clip OUTLY_UDOT ../state_clp3 OUTLY_UDOT2 line
Arc: additem OUTLY_UDOT2.AAT OUTLY_UDOT2.AAT oldlength 4 12 f 3

Tables: sel OUTLY_UDOT2.AAT
274 Records Selected.
Tables: calc oldlength = length
Tables: q

Arc: additem OUTLY_UDOT2.AAT OUTLY_UDOT2.AAT wdvmt2 8 10 F 0
Arc: additem OUTLY_UDOT2.AAT OUTLY_UDOT2.AAT wevmt2 8 10 F 0

5/19/00

Takin' a break here from the outlying data and going back to the 4 county wf area.

Converted the shape files into wf_artfre for aterials and freeways. Going to remove all of the

superfluous items and create a classification item based on free flow speed, since I can see what that is but don't see a functional class item. Also removed all of the local road links. These are at speed of 20 mph.
Did lots of stuff, now I am going to create a vmt-by-roadclass surrogate.

Arcedit: show ec
/TRINIDAD/UAM_AERO/WS.UAMAERO/WS.MOBILE/WF_ARTFRE
Arcedit: sel all
Arcedit: calc vmtday = (distance * DAILY_VOL)
Arcedit: calc vmtsum = (distance * SUM_4PDVOL)
Arcedit: save

Prepare to identity the mobile coverage
Arc: additem WF_ARTFRE.aat WF_ARTFRE.aat oldlength 4 12 f 3
Tables: calc oldlength = length

Now Identity this one plus the outylying UDOT line work.

Arc: identity WF_ARTFRE ../AERO_3_fip WF_ARTFRE2 line
Arc: identity OUTLY_UDOT2 ../AERO_3_fip OUTLY_UDOT3 line
Recalculate the vmt based on new link lengths from the identitied cell boundaries
Arc: additem WF_ARTFRE2.aat WF_ARTFRE2.aat VMTDAY2 4 12 F 3
Arc: additem WF_ARTFRE2.aat WF_ARTFRE2.aat VMTsum2 4 12 f 3

Tables: sel WF_ARTFRE2.aat
Tables: calc VMTDAY2 = (vmtday * (length / oldlength))
Tables: calc vmtsum2 = (vmtsum * (length / oldlength))

QA

Tables: statistics

Enter statistical expressions. Type END or blank line to end.
Statistics: sum VMTDAY2
Statistics: sum vmtsum2
Statistics: end
Record FREQUENCY SUM-VMTDAY2 SUM-VMTSUM2
1 13210 31792924.590140 32105203.425211
Tables: sel wf_artfre.aat
10219 Records Selected.
Tables: statistics

Enter statistical expressions. Type END or blank line to end.
Statistics: sum vmtday
Statistics: sum vmtsum

Statistics: end
Record FREQUENCY SUM-VMTDAY SUM-VMTSUM
1 10219 31790301.645160 32102139.046647

Looks good, real good.

Now for the outlying counties

Arc: tables

TABLES Version 8.0.1 (Fri Dec 3 10:45:59 PST 1999)

Tables: sel OUTLY_UDOT3.aat
972 Records Selected.
Tables: calc WDVMT = (WDVMT * (length / oldlength))
Tables: calc WEVMT = (WEVMT * (length / oldlength))
Tables: calc VMT = (VMT * (length / oldlength))
Tables: statistics
QA
Enter statistical expressions. Type END or blank line to end.
Statistics: sum WDVMT
Statistics: sum WEVMT
Statistics: sum VMT
Statistics: end
Record FREQUENCY SUM-WDVMT SUM-WEVMT SUM-VMT
1 972 3662164.956077 3785967.993834 4632908.221970
Tables: sel OUTLY_UDOT2.aat
274 Records Selected.
Tables: statistics

Enter statistical expressions. Type END or blank line to end.
Statistics: sum WDVMT
Statistics: sum WEVMT
Statistics: sum VMT
Statistics: end
Record FREQUENCY SUM-WDVMT SUM-WEVMT SUM-VMT
1 274 3662164.000000 3785967.000000 4632907.000000

Looks good again.

Now I want to get these values into the domain grid.

Arc: copy ../AERO_3_FIP ./mob_vmt_3

I think I need to stop right here and wait until I get my emissions data. I think I really want to step back to the point before I identitied the line coverages and put my emissions by pollutant by vehicle-type by road class into the coverage. Then identity it and sum up my matrix of emissions.

One thing I will do right now is to create better items for selecting by facility class.

First, kill my identity covs. I will recreate them later when I have the emissions in.

5/26/00

vmt for the outlying counties by road class. FC 1 = freeway, FC 2 = arterial

Arcedit: sel county = 3
Arcedit: resel fc = 1
14 element(s) now selected

Record	FREQUENCY	SUM-WDVMT	SUM-WEVMT	SUM-VMT
1	14	516974.000000	570689.000000	671391.000000

Arcedit: sel county = 3
59 element(s) now selected
Arcedit: resel fc = 2
45 element(s) now selected

Record	FREQUENCY	SUM-WDVMT	SUM-WEVMT	SUM-VMT
1	45	428228.000000	386018.000000	499482.000000

Arcedit: sel county = 5
30 element(s) now selected
Arcedit: resel fc = 1
0 element(s) now selected
Arcedit: sel county = 5
30 element(s) now selected
Arcedit: resel fc = 2
30 element(s) now selected

Record	FREQUENCY	SUM-WDVMT	SUM-WEVMT	SUM-VMT
1	30	226901.000000	215267.000000	275802.000000

Arcedit: sel county = 23
29 element(s) now selected
Arcedit: resel fc = 1
6 element(s) now selected

```
Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1      6         318843.000000     351976.000000     414095.000000

Arcedit: sel county = 23
29 element(s) now selected
Arcedit: resel fc = 2
23 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     23         133236.000000     134930.000000     170804.000000

Arcedit: sel county = 29
22 element(s) now selected
Arcedit: resel fc = 1
10 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     10         146012.000000     161186.000000     189631.000000

Arcedit: sel county = 29
22 element(s) now selected
Arcedit: resel fc = 2
11 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     11          27188.000000      27540.000000      34859.000000

Arcedit:  sel county = 29
22 element(s) now selected
Arcedit: resel fc = 3
1 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1      1             55.000000         57.000000         70.000000

Arcedit: sel county = 33
2 element(s) now selected
Arcedit: list fc
Record  FC
  76  2
  80  2

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1      2          6241.000000       6316.000000       7997.000000
```

```
Arcedit: sel county = 39
8 element(s) now selected
Arcedit: resel fc = 2

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     8          59532.000000      60285.000000      76319.000000

Arcedit: sel county = 43
61 element(s) now selected
Arcedit: resel fc = 1
18 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     18         552161.000000     609544.000000     717097.000000

Arcedit: sel county = 43
61 element(s) now selected
Arcedit: resel fc = 2
41 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     41         271294.000000     274779.000000     347817.000000

Arcedit: sel county = 43
61 element(s) now selected
Arcedit: resel fc = 3
2 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     2           1796.000000       1865.000000       2303.000000

Arcedit: sel county = 45
39 element(s) now selected
Arcedit: resel fc = 1
7 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1     7          287174.000000     317021.000000     372957.000000

Arcedit: sel county = 45
39 element(s) now selected
Arcedit: resel fc = 2
32 element(s) now selected
```

```
Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1    32         369136.000000    347019.000000    445364.000000

Arcedit: sel county = 51
24 element(s) now selected
Arcedit: resel fc = 2
23 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1    23         317162.000000    321235.000000    406623.000000

Arcedit: sel county = 51
24 element(s) now selected
Arcedit: resel fc = 3
1 element(s) now selected

Record  FREQUENCY        SUM-WDVMT        SUM-WEVMT        SUM-VMT
   1    1          231.000000       240.000000       296.000000
```

6/5/00

After many days I am back to this process. It looks to me like I have the arterial, freeway and ramp data done by cell for the WF counties. Still need to identity the outlying counties, do a QA on both.

Creating the cell-id'd vmt for the outlying counties is done and documented in id-vmt.aml.

Percentages by-county of vmt for arterial and freeway is now done; method documented in "id-vmt.aml".

"FT" in wf_artfre2 is:

- 0 = local or centroid connector
- 1 = freeway and expressway
- 2 - 6 = various arterials
- 7 = ramps

Need to fill in I80 from Parleys to Summit county line. Will do this in AE by filling in bogus lines, grid cell boundary to grid cell boundary following the I80 line in the UDOT cov. Then I will find out the vmt as given by UDOT for those segements and attribute the data accordingly.

To get the vmt on those links

```
copy WF_ARTFRE2   to WF_ARTFRE2       a
Record  FREQUENCY        SUM-VMT
   1    6          389979.000000
Arcedit: ec WF_ARTFRE2A;ef arc;draw
```

The edit coverage is now
/TRINIDAD/UAM_AERO/WS.UAMAERO/WS.MOBILE/WF_ARTFRE2A
13221 element(s) for edit feature ARC
Coverage has no COGO attributes
Arcedit: sel ft = 99
Arcedit: calc vmtday2 = (length / 14861) * 389979
Now I have vmt on each section of I 80 in the east county.
Arcedit: calc ft = 1
Now adapt that aml to put the percentages into the WF counties. Documented in id-vmt2.aml

QA looks good in that the percentage values add to 1 for a given county. The vmt numbers for the coverages were QA'd up on page 3 of these notes. In the outlying counties the total vmt for each county sums up between outly_udot2 vmt and outly_udot3 vmt2 and the percentages add up to 1.

6/6/00

Done with the WF counties. Next thing to do now is to get the local vmt surrogates using population density for the WF counties, based on TAZ boundaries and put the local vmt in the corporate boundaries in the outlying counties.

For the local surrogates I don't even need vmt. I just need population % of the cell that is in the whole county.

Workspace: /TRINIDAD/UAM_AERO/WS.UAMAERO/WS.MOBILE
Arc: copy ../ws.pop/POP96_2KM wf_loc
Drop some superfluous items
Do an aml, all-loc.aml, to get the local percentages for the WF counties and the outlying counties. The logic for this process will be apparent in this aml. Also surrogates for arterial vmt, rural arterial, not on the outlying county network will also be classed in this process.

There are two sets of vmt data for the outlying counties. One is the link based vmt from the A/I coverage, UDOT_AERO. The other is in the spreadsheet, aqsipcnty.xls. This is the vmt by city and the vmt outside the city but inside the county and not on the network. These two data sets will be combined into a spreadsheet called outlyvmt.sdc. It will have the totals of these two data sets for each county and will be used to calculate the mobile emissions from the factors developed with part5 and mobile5.

Since I have already taken into account the population in the towns and outlying areas of the counties when I did the original population gridding I am going to distribute these emissions by pop density just as I did with the WF counties. The pop gridding process is detailed in notes.sdw in ws.pop.

In doing this gridding I will put even some more vmt in cells that have the road network going through them. It is not worth the effort to avoid those cells for the following reasons:

The fraction of total mobile emissions contained in these counties is miniscule compared to the entire domain.
We don't *really* know where these vmt are located in the county anyway. Population density gets at the town based vmt well. The outlying vmt is a large part of this second set of numbers. It will be spread around the county based on population and putting some small percent more vmt on then network cells will be meaningless in the overall scheme of things.

Did it. QA looks good.

Now copy these mobile surrogate files into ws.surrogates, finish the dump surrogates and sew them all together over there.

Arc: copy ALL_LOC ../ws.surrogate/ALL_LOCAL
Arc: copy WF_ARTFRE3 ../ws.surrogate/WF_ARTFRE3
Arc: copy OUTLY_UDOT3 ../ws.surrogate/OUTLY_UDOT3

Done with the mobile part for now. 6/7/00
Need to do some frequency queries on artfre3 and udot3 to get the right values in the final surrogate file.

6/12/00

I Found out that there are some more vmt that need to be added to Weber Co. The method for local still needs to be determined, however, for arterial I will make a separate cov of just the outlying arterials from udot. ID this vmt with the rural arterial surrogate and keep track of the emissions somewhat separately. This meaning(lessness) of the previous statement will become known shortly.

Arc: ae;ec UDOT_AERO;ef arc;de arc;draw
Arcedit: sel webart = 1;draws
13 element(s) now selected
Arcedit: put web_art
Arcedit: q

Arc: additem WEB_ART.aat WEB_ART.aat vmt2 4 12 f 3
Arc: additem WEB_ART.aat WEB_ART.aat per42 4 12 f 7 (per42 = percent of surr. # 42)

Arc: identity WEB_ART MOB_VMT_3 WEB_ART2 line
Tables: sel WEB_ART2.aat
Tables: calc vmt2 = vmt * (length / oldlength)
Statistics: sum vmt2
Statistics: end
Record FREQUENCY SUM-VMT2
1 76 108102.365506

Tables: calc per42 = vmt2 / 108102

QA
Statistics: sum per42
Statistics: end
Record FREQUENCY SUM-PER42
1 76 1.000003
Looks good.

AML'S USED TO PROCESS THE MOBILE VMT SURROGATES

ID-VMT2.AML

```
/* 6/5/00
/* id-vmt2.aml
/* Calculates the % of a counties vmt-by-road class for each cell
/*
&echo &on

&if [exists wf_artfre3 -cover] &then
   kill wf_artfre3 all
copy ws.covs/wf_artfre2a wf_artfre3
&s cov = wf_artfre3
additem %cov%.aat %cov%.aat perft1 4 12 f 7
additem %cov%.aat %cov%.aat perft2 4 12 f 7
additem %cov%.aat %cov%.aat perft7 4 12 f 7
additem %cov%.aat %cov%.aat surrogate 2 2 i

/* There are 2 different items in the coverage of calculated vmt/day.
/* Those are vmtday and vmtsum.  Each are calculated by multiplying distance
/* times daily_vol for vmtday or sum_4pdvol for vmtsum.  To get the % I
/* am going to use just one, that is vmtday.  I assume they should both
/* give me similar % of daily vmt for a link.

ap
clearsel

&s fil1 = wffip
&s unit1 = [open %fil1% 0 -read]

&do n = 1 &to 4
   &type %n%
   &s fip = [read %unit1% readstatus]
   clearsel
   resel %cov% line fips = %fip%

/* ft = 1
   resel %cov% line ft = 1
      &s t1 = [extract 1 [show select %cov% line]]
         &if %t1% = 0 &then
         &goto jump1
   statistics %cov% line
   sum vmtday2
```

```
   end
   [unquote '']

   &s ft1 = [show statistic 1 1]

   calc %cov% line perft1 = vmtday2 / %ft1%
   calc %cov% line surrogate = 20
         &label jump1     /* jumped over a 0 reselect

   clearsel

/* ft = 2
   resel %cov% line fips = %fip%
   resel %cov% line ft = 2 or ft = 3 or ft = 4 or ft = 5 or ft = 6
      &s t1 = [extract 1 [show select %cov% line]]
         &if %t1% = 0 &then
         &goto jump1
   statistics %cov% line
   sum vmtday2
   end
   [unquote '']

   &s ft2 = [show statistic 1 1]

   calc %cov% line perft2 = vmtday2 / %ft2%
   calc %cov% line surrogate = 40
         &label jump1     /* jumped over a 0 reselect

   clearsel

/* ft = 7
   resel %cov% line fips = %fip%
   resel %cov% line ft = 7
      &s t1 = [extract 1 [show select %cov% line]]
         &if %t1% = 0 &then
         &goto jump1
   statistics %cov% line
   sum vmtday2
   end
   [unquote '']

   &s ft7 = [show statistic 1 1]

   calc %cov% line perft7 = vmtday2 / %ft7%
   calc %cov% line surrogate = 30
         &label jump1     /* jumped over a 0 reselect

   clearsel

&end

&s close = [close %unit1%]
&echo &off
q
&return
```

ALL-LOC.AML

```
/* 6/5/00
/* wf-loc.aml
/* Calculates the % of a counties local vmt for each cell
/*
&echo &on

&if [exists all_local -cover] &then
   kill all_local all
copy ../ws.pop/pop96_2km all_local
&s cov = all_local
additem %cov%.pat %cov%.pat perloc 4 12 f 7
additem %cov%.pat %cov%.pat perartrural 4 12 f 7
additem %cov%.pat %cov%.pat surrogate 2 2 i
additem %cov%.pat %cov%.pat surrogate2 2 2 i
/*
/* surrogate2 is an item to attribute the rural arterial ssc code
ap
clearsel

&s fil1 = wffip
&s unit1 = [open %fil1% 0 -read]

&do n = 1 &to 4               /* WF counties
   &type %n%
   &s fip = [read %unit1% readstatus]
   clearsel
   resel %cov% poly fips = %fip%

   statistics %cov% poly
   sum pop96
   end
   [unquote '']

   &s loc = [show statistic 1 1]

   calc %cov% poly perloc = pop96 / %loc%
   calc %cov% poly surrogate = 10
   clearsel
&end

&s fil2 = outfip
&s unit2 = [open %fil2% 0 -read]


&do s = 1 &to 9           /* outlying, including rural arterial
   &type %s%
   &s fip = [read %unit2% readstatus]
   clearsel
   resel %cov% poly fips = %fip%

   statistics %cov% poly
   sum pop96
   end
```

```
   [unquote '']

   &s locrur = [show statistic 1 1]

   calc %cov% poly perloc = pop96 / %locrur%
   calc %cov% poly perartrural = pop96 / %locrur%
   calc %cov% poly surrogate = 10
   calc %cov% poly surrogate2 = 41

   clearsel
&end /* end s

&s close = [close -all]
&echo &off
q
&return
```